

B2  
media-facing surface. A layer 155 of hard, amagnetic, electrically insulating material such as Alumina or DLC is formed over and around the second yoke layer 130, and after planarization of those layers a small portion of layer 155 is disposed between the yoke layer 130 and the overcoat 106. Another layer 135 of hard, amagnetic, electrically insulating material such as Alumina or DLC is formed atop the planarized second yoke layer 130 and surrounding layer 155, protecting the transducer 102 on a trailing end 138 of the head 100. After dicing the wafer into rows each containing multiple transducers such as transducer 102, the rows are rotated ninety degrees and a protective overcoat 106 is then deposited while forming the media-facing surface 108.

---

In the Claims:

Please cancel claims 2-11, 13-22, 24-46 and 48-55 without prejudice.

Please amend claims 1, 12, 23, and 47 to read as shown below. A separate set of Marked-Up Claims accompanies this Amendment.

Please add new claims 82-141 as shown below.

---

- B3  
Sub  
D1
1. (Twice Amended) A transducer comprising:  
a plurality of solid layers, including a magnetically soft loop substantially encircling an electrically conductive coil section and terminating in leading and trailing magnetically soft layers separated by an amagnetic gap layer, said trailing magnetically soft layer being oriented substantially perpendicular to said amagnetic layer, wherein said trailing magnetically soft layer has a width measured in a direction substantially parallel to said amagnetic layer, said width being less than about four hundred nanometers and greater than about twenty angstroms.
-

12. (Twice Amended) A transducer for an information storage system, the transducer comprising:

B5-Sub D1  
a plurality of solid layers, including a magnetoresistive sensor layer and a magnetically soft loop substantially encircling an electrically conductive coil section and terminating adjacent a media-facing surface in leading and trailing magnetically soft layers separated by an amagnetic gap layer, said trailing magnetically soft layer being oriented substantially perpendicular to said magnetoresistive sensor layer and having a width measured in a direction substantially parallel to said magnetoresistive sensor layer, said width being less than about four hundred nanometers and greater than about twenty angstroms.

23. (Twice Amended) A transducer for an information storage system, the transducer comprising:

B6  
a magnetically soft loop substantially encircling an electrically conductive coil section and terminating adjacent a media-facing surface in leading and trailing magnetically soft layers separated in a longitudinal direction by an amagnetic gap layer, said longitudinal direction being perpendicular to a track-width direction, wherein said trailing magnetically soft layer has a growth morphology that is not substantially perpendicular to said track-width direction.

B7

47. (Twice Amended) An information storage system comprising:  
a moving medium,  
a transducer disposed adjacent said moving medium, said transducer containing a plurality of layers deposited on a wafer substrate, said layers including a magnetically soft loop substantially encircling an electrically conductive coil section and terminating adjacent said medium in a leading magnetically soft pole-tip layer and a trailing magnetically soft pole-tip layer, with an amagnetic layer disposed between said pole-tip layers,  
wherein a portion of said medium adjacent to said transducer travels in a longitudinal direction from said leading pole-tip layer to said trailing pole-tip layer, and said trailing pole-tip layer has a width measured substantially perpendicular to said longitudinal direction, said width being less than four hundred nanometers.

82. (New) The transducer of claim 1, wherein a distance between said magnetically soft layers is not substantially greater than said width.

83. (New) The transducer of claim 1, wherein said trailing magnetically soft layer has a length measured in a direction substantially perpendicular to said amagnetic layer, with said length being at least six times greater than said width.

84. (New) The transducer of claim 1, wherein said trailing magnetically soft layer contains a refractory metal.

85. (New) The transducer of claim 1, wherein said trailing magnetically soft layer contains material having a  $B_s$  higher than that of Permalloy.

86. (New) The transducer of claim 1, wherein said leading magnetically soft layer is substantially perpendicular to said trailing magnetically soft layer.

87. (New) The transducer of claim 1, wherein said trailing magnetically soft layer contains vacuum-deposited material.

88. (New) The transducer of claim 1, further comprising a magnetoresistive sensor layer disposed adjacent said leading magnetically soft layer and oriented substantially perpendicular to said trailing magnetically soft layer.

89. (New) The transducer of claim 1, wherein said magnetically soft loop includes a magnetically soft trailing yoke layer that adjoins said trailing magnetically soft layer.

90. (New) The transducer of claim 89, wherein said trailing yoke layer extends further in said direction substantially parallel to said amagnetic layer than in a direction substantially perpendicular to said amagnetic layer and aligned with said leading and trailing magnetically soft layers.

91. (New) The transducer of claim 12, wherein said trailing magnetically soft layer is substantially perpendicular to said amagnetic layer.

92. (New) The transducer of claim 12, wherein said trailing magnetically soft layer is substantially perpendicular to said leading magnetically soft layer.

93. (New) The transducer of claim 12, wherein said trailing magnetically soft layer has a length measured in a direction substantially perpendicular to said magnetoresistive sensor layer, with said length being at least six times greater than said width.

94. (New) The transducer of claim 12, wherein said width of said trailing magnetically soft layer is less than about two hundred nanometers.

95. (New) The transducer of claim 12, wherein said width of said trailing magnetically soft layer is not substantially greater than a thickness of said amagnetic layer.

96. (New) The transducer of claim 12, wherein said trailing magnetically soft layer contains material having a  $B_s$  higher than that of Permalloy.

Sub  
D1  
97. (New) The transducer of claim 12, wherein said trailing magnetically soft layer contains a refractory metal.

98. (New) The transducer of claim 12, wherein said trailing magnetically soft layer is sputter-deposited.

99. (New) The transducer of claim 12, wherein said leading magnetically soft layer is sputter-deposited.

100. (New) The transducer of claim 12, wherein said magnetically soft loop includes a magnetically soft trailing yoke layer that adjoins said trailing magnetically soft layer.

101. (New) The transducer of claim 100, wherein said trailing yoke layer extends further in said direction substantially parallel to said magnetoresistive sensor layer than in a direction substantially perpendicular to said magnetoresistive sensor layer and aligned with said leading and trailing magnetically soft layers.

102. (New) The transducer of claim 23, wherein said growth morphology is substantially parallel to said track-width direction.

103. (New) The transducer of claim 23, wherein said trailing magnetically soft layer has a width measured in said track-width direction width that is less than about four hundred nanometers.

104. (New) The transducer of claim 23, wherein said trailing magnetically soft layer has a width measured in said track-width direction that is not substantially greater than a thickness of said amagnetic layer measured in said longitudinal direction.

105. (New) The transducer of claim 23, wherein said trailing magnetically soft layer has a width measured in said track-width direction and a length measured in said longitudinal direction, with said length being at least six times greater than said width.

106. (New) The transducer of claim 23, wherein said trailing magnetically soft layer consists essentially of sputtered material.

107. (New) The transducer of claim 23, wherein said trailing magnetically soft layer contains material having a  $B_s$  higher than that of Permalloy.

108. (New) The transducer of claim 23, further comprising a magnetically soft shield layer oriented substantially perpendicular to said trailing magnetically soft layer and separated from said leading magnetically soft layer by a second amagnetic layer.

109. (New) The transducer of claim 23, wherein said leading magnetically soft layer is oriented substantially perpendicular to said trailing magnetically soft layer.

110. (New) The transducer of claim 23, wherein said growth morphology of said trailing magnetically soft layer is more parallel than perpendicular to said track-width direction.

111. (New) The transducer of claim 23, wherein said magnetically soft loop includes a magnetically soft trailing yoke layer that adjoins said trailing magnetically soft layer.

112. (New) The transducer of claim 111, wherein said trailing yoke layer extends further in said track-width direction than in said longitudinal direction.

113. (New) The system of claim 47, wherein said trailing pole-tip layer has a length measured substantially parallel to said longitudinal direction, said length being at least five times greater than said width.

114. (New) The system of claim 47, wherein said trailing pole-tip layer has a width measured along said direction that is less than about two hundred nanometers.

115. (New) The system of claim 47, wherein said trailing pole-tip layer contains a refractory metal.

116. (New) The system of claim 47, wherein said trailing pole-tip layer contains material having a  $B_s$  higher than that of Permalloy.

117. (New) The system of claim 47, wherein said trailing pole-tip layer consists essentially of sputtered material.

BB  
118. (New) The system of claim 47, further comprising a magnetoresistive sensor layer disposed adjacent said leading pole-tip layer and oriented substantially perpendicular to said trailing pole-tip layer.

119. (New) The system of claim 47, wherein said magnetically soft loop includes a magnetically soft trailing yoke layer that adjoins said trailing pole-tip layer.

120. (New) The system of claim 119, wherein said trailing yoke layer extends less in said longitudinal direction than in a direction perpendicular to said longitudinal direction.

121. (New) A transducer comprising:

a magnetoresistive sensor layer,

Sub DC  
a magnetically soft loop disposed adjacent to said magnetoresistive sensor layer, traversed by an electrically conductive coil section and including magnetically soft leading and trailing pole-tips disposed adjacent to a media-facing surface, said trailing pole-tip aligned with said magnetoresistive sensor layer along a longitudinal direction and having a width measured in a track-width direction that is perpendicular to said longitudinal direction, said longitudinal and track-width directions being substantially parallel to said media-facing surface, said width being less than four hundred nanometers and greater than twenty angstroms.

122. (New) The transducer of claim 121, wherein said trailing pole-tip has a length measured in said longitudinal direction, said length being at least five times greater than said width.

123. (New) The transducer of claim 121, wherein said leading and trailing pole-tips are separated by a submicron nonferromagnetic gap layer.

124. (New) The transducer of claim 121, wherein said trailing pole-tip consists essentially of sputtered material.

125. (New) The transducer of claim 121, wherein said trailing pole-tip contains material having a  $B_s$  higher than that of Permalloy.

126. (New) The transducer of claim 121, wherein said magnetically soft loop includes a magnetically soft yoke layer adjoining said trailing pole-tip.

127. (New) The transducer of claim 126, wherein said yoke layer extends further in said track-width direction than in said longitudinal direction.

128. (New) A transducer comprising:  
a magnetoresistive sensor layer,  
a magnetically soft loop disposed adjacent to said magnetoresistive sensor layer, substantially encircling an electrically conductive coil section and terminating adjacent a media-facing surface in magnetically soft first and second pole-tips, said second pole-tip aligned with said magnetoresistive sensor layer along a longitudinal direction, having a width measured in a track-width direction that is perpendicular to said longitudinal direction and substantially parallel to said media-facing surface, and having a face adjacent said media-facing surface, said width not exceeding four hundred nanometers at any part of said face.



129. (New) The transducer of claim 128, wherein said second pole-tip has a length measured in said longitudinal direction, said length being at least five times greater than said width.

130. (New) The transducer of claim 128, wherein said first and second pole-tips are separated by a submicron nonferromagnetic gap layer.

131. (New) The transducer of claim 128, wherein said second pole-tip consists essentially of sputtered material.

132. (New) The transducer of claim 128, wherein said second pole-tip contains material having a  $B_s$  higher than that of Permalloy.

133. (New) The transducer of claim 128, wherein said magnetically soft loop includes a magnetically soft yoke layer adjoining said second pole-tip.

134. (New) The transducer of claim 133, wherein said yoke layer extends further in said track-width direction than in said longitudinal direction.

135. (New) A transducer for an information storage system, the transducer comprising:

a magnetically soft loop substantially encircling an electrically conductive coil section and terminating adjacent a media-facing surface in first and second magnetically soft layers separated in a longitudinal direction by a non-ferromagnetic layer, said longitudinal direction being perpendicular to a track-width direction that is substantially parallel to said media-facing surface, wherein said second magnetically soft layer has a growth morphology that is not substantially parallel to said longitudinal direction, has a width measured in said track-width direction, and has a face adjacent said media-facing surface, said width not exceeding four hundred nanometers at any part of said face.